The Management University of Africa

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UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DEGREE OF BACHELOR OF MANAGEMENT AND LEADERSHIP/ BACHELOR OF COMMERCE

BML 202/BCM 126: QUATITATIVE TECHNIQUES

DATE: ***3RD APRIL 2018***

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

QUESTION ONE

a) Evaluate

i) dy/dx for the function $y = 2x^2 (5x + 3)$ **(3 marks)**

ii) $\int_1^3 (3x^2 + 3)dx$ **(4 marks)**

b) A movie theatre charges Sh. 80 for each adult admission and Sh. 50 for each child. One Saturday, 525 tickets were sold, bringing in a total of 32,550.

i. Formulate the equations for this problem **(4 marks)**

ii. Use inverse matrix method to find how many of each type of ticket were sold? **(6 marks)**

c) A company is considering investing in one of three investment opportunities A, B and C under certain economic conditions. The payoff matrix for this situation is economic condition

Investment opportunities	1 £	2 £	3 £
A	5000	7000	3000
B	-2000	10000	6000
C	4000	4000	4000

Determine the best investment opportunity using the following criteria

i. Maximin **(2 marks)**

ii. Maximax **(2 marks)**

iii. Hurwicz (Alpha = 0.3 **(4 marks)**

QUESTION TWO

a) Given the function

$y = 1/3\, x^3 + x^2 - 35x + 10$

Determine the critical values and find out whether these critical values are maxima or minima **(6 marks)**

b) Coco cola sells several brands of soft drinks and the demand for the most popular soft drink coke is 30, 000, 000 per year spread evenly offer the year. The ordering cost of shs 1, 000, 000 per order is incurred and the company estimate that the annual cost of holding this soft drink is shs. 7.50 per bottle. Determine:

(i) The economic ordering quantity for this company **(3 marks)**

(ii) The minimum total annual cost of ordering and holding the coke bottles **(3 marks)**

c) Define the following terms as used in quantitative techniques **(3 marks)**

i) Marginal revenue

ii) Binding constraints

iii) Optimization

QUESTION THREE

a) A firm uses three machines in the manufacture of three products. Each unit of product A requires 3, 2 and 1 hour on machine I, II and III respectively. Each unit of product B requires 4, 1 and 3 hour on machine I, II and III respectively while each unit of product C requires 2hours each on the three machines. The contribution margin of the three products is Sh. 30, Sh. 40 and Sh. 35 per unit respectively. The machine hours available on the three machines are 90, 54 and 93 respectively. Required:-

i. Formulate the above problem as a linear programming problem and find the optimal solution given the optimal mix is x1=0, x2 =12 and x3=21 **(6 marks)**

ii. Explain why it is difficult to solve this problem by graphical method **(3 marks)**

b) The Beta Company is proposing to introduce to the market a remote controlled toy car. There are three different possible models A, B and C they models they manufacture. However, they have the capacity of manufacturing only one of them. The probable acceptance of any of the three models is given

below.

		Profits (shs. 00,000)		
Model acceptance	Probability	Model A	Model B	Model C
Excellent	0.4	120	100	60
Moderate	0.5	80	60	50
Poor	0.1	-30	-20	10

a) Determine the best decision if the expected monetary value criterion is used **(4 marks)**

b) Similar decision could be obtained if instead expected opportunity value was used. Explain **(2 marks)**

QUESTION FOUR

a) Distinguish between decision making in environment of certainty and environment of uncertainty **(4 marks)**

b) ABC Ltd employed a cost accountant who developed two functions to describe the operations of the firm. He found :

The marginal revenue function to be $MR = 25 - 5x - 2x^2$ and

The marginal cost function to be $MC = 15 - 2x - x^2$ where x is the level of output. Determine:

i) Total revenue function and total cost function given fixed cost zero **(4 marks)**

ii) The output that maximize profit **(5 marks)**

iii) The total maximum profit **(2 marks)**

QUESTION FIVE

A Highway contract have been given a contract to recarpet Mai Mahiu road. The project manager has identified eight essential activities in this network. He has also listed the activities time as below.

Activity	Preceding Activity	Time (in weeks)		
		Optimistic	Most likely	Pessimistic
A	-	2	3	4
B	-	5	5.5	9
C	-	6	7	8
D	A	4	8.5	10
E	C	1	3.5	9
F	B, E	1	3	5
G	C	8	9	16
H	F, G	1	3	5

Required

a) Calculate the expected time **(8 marks)**

b) Draw the project network diagram **(5 marks)**

c) Determine the project duration and the critical path **(2 marks)**

QUESTION SIX

With the increasing manufacturing costs in Kenyan, QTZ Company aims at minimizing its inventory related costs on its products. Management has determined from analysis of its accounting and production data that the demand of one of its products is 9,000 units per annum which is uniformly distributed over the year. Its cost price is Sh. 2 per unit, ordering cost is Sh. 40 per order and the inventory carrying charge is 9% of the inventory value. Further, it is known that the lead time is uniform and equals 8 working days and that the total working days in a year are 300. Determine:-

i. The company's EOQ **(3 marks)**

ii. The optimum number of orders per annum. **(2 marks)**

iii. The total cost with the policy of ordering equal to EOQ. **(4 marks)**

iv. The re-order level **(2 marks)**

v. The number of day's stock at re-orders level **(2 marks)**

vi. The length of the inventory cycle **(2 marks)**

FORMULAS

1. $EOQ = \sqrt{\frac{2.C_0.D}{C_c}}$ And C c = C h = i × C/unit

2. Number of orders = demand / EOQ

3. Total Cost (TC) = D × C/unit + EOQ/2 × Ch + Demand/ EOQ × Co

4. Break-Even volume / BEP $_{(unit)}$ = $\frac{\text{Fixed costs}}{\text{Revenue per unit – Variable cost per unit}}$

5. Activity variances, $\sigma^2 = \left(\frac{b-a}{6}\right)^2$ Where, b = Pessimistic time &

   a = Optimistic time

6. Activity standard deviation, $\sigma = \frac{b-a}{6}$

7. Standard deviation of the project, $\delta = \sqrt{sum\ of\ \text{var}iances\ of\ critical\ activities}$

8. The Z-formula = $\frac{\text{(X – calculated project completion time)}}{\text{Project standard deviation}}$

9. Open input-output model, $X = (I_n - M)^{-1} d$

10. EMV = Σ X (P(X))